

NINGXIA XIANGSHAN WIND FARM PROJECT

Document Prepared By Beijing Cronus Technology Consultancy Centre

Project Title	Ningxia Xiangshan Wind Farm Project
Version	2.0
Date of Issue	07/04/2019
Monitoring Period	15/04/2017 to 28/02/2019
Prepared By	Beijing Cronus Technology Consultancy Centre
Contact	Tel: +86-10-67618208, Email: Yaobaojie@126.com

Table of Contents

1.	Project Details.....	3
1.1	Summary Description of the Project and its Implementation Status	3
1.2	Sectoral Scope and Project Type	4
1.3	Project Proponent.....	4
1.4	Other Entities Involved in the Project.....	4
1.5	Project Start Date	4
1.6	Project Crediting Period.....	5
1.7	Project Scale and Estimated GHG Emission Reductions or Removals	5
1.8	Description of the Project Activity	5
1.9	Project Location	6
1.10	Conditions Prior to Project Initiation.....	7
1.11	Compliance with Laws, Statutes and Other Regulatory Frameworks	8
1.12	Ownership and Other Programs	8
1.12.1	Project Ownership	8
1.12.2	Emissions Trading Programs and Other Binding Limits	8
1.12.3	Other Forms of Environmental Credit.....	8
1.12.4	Participation under Other GHG Programs.....	8
1.12.5	Projects Rejected by Other GHG Programs	8
1.13	Additional Information Relevant to the Project.....	8
2	Application of Methodology	9
2.1	Title and Reference of Methodology	9
2.2	Project Boundary	12
2.3	Baseline Scenario.....	14
2.4	Additionality	14
2.5	Methodology Deviations	22
3	ESTIMATed GHG Emission Reductions and Removals	22
3.1	Baseline Emissions.....	22
3.2	Project Emissions	29
3.3	Leakage.....	29
3.4	Estimated Net GHG Emission Reductions and Removals.....	29
4	Monitoring	30
4.1	Data and Parameters Available at Validation.....	30
4.2	Data and Parameters Monitored.....	32
4.3	Monitoring Plan.....	32
5	Safeguards.....	34
5.1	No Net Harm	34
5.2	Environmental Impact	34
5.3	Local Stakeholder Consultation	36
5.4	Public Comments.....	37
6	ACHieVED GHG Emission Reductions and Removals	37
6.1	Data and Parameters Monitored.....	37
6.2	Baseline Emissions.....	39
6.3	Project Emissions	40
6.4	Leakage.....	42
6.5	Net GHG Emission Reductions and Removals.....	42

1. PROJECT DETAILS

1.1 Summary Description of the Project and its Implementation Status

Ningxia Xiangshan Wind farm Project (hereafter referred to as the Project) is located in Zhongwei City, Ningxia Hui Autonomous Region, People's Republic of China. The project owner is Ningxia Zhongwei Aluminum New Energy Co., Ltd.

The project started construction on 01/11/2016 and starts commercial operation on 15/04/2017 and fully operation on 20/07/2017.

The proposed project has a total installed capacity of 397.5MW consisting of 265 wind turbines with unit capacity of 1,500kW. The expected annual power delivered to the grid is 948,633.8 MWh. The power generated will be delivered to the Northwest Power Grid (NWPG) via Ningxia Power Grid.

The scenario existing prior to the start of the implementation of the project activity is the same as the baseline scenario as identified in section 2.3, i.e. electricity would have otherwise been generated by the operation of power plants connected to NWPG and by the addition of new generation sources of NWPG. When the proposed project is put into operation, the power generated will substitute a part of power supply in NWPG which is dominated by fuel-fired power plants and thus reduce greenhouse gas (GHG) emission through avoiding CO₂ emissions produced by NWPG. The estimated annual average emission reduction is 727,982 tCO₂e. The VCS crediting period of the Project is from 15/04/2017 to 14/04/2027, totally 10 years. The estimated emission reduction during this period is 7,279,820 tCO₂e. The emission reduction during this monitoring period from 15/04/2017 to 28/02/2019 is 1,535,574 tCO₂e.

The proposed project will contribute to sustainable development mainly by:

- Reducing the emission of CO₂ and other pollutants compared with fuel-fired power plant;
- Creating local employment opportunities during the construction (more than 200 people) and operation (200 people) of the proposed project and improving the living standard of local people;
- With the help of the road, which was constructed due to the proposed project, agriculture and other products could be transported from the mountains of Xiangshan to city by Local farmers. It can reduce poverty, which is very important to Ningxia, a poverty-stricken region energy resources of NWPG;
- The implementation of the proposed project will help to change the energy structure, and thereby, contribute to the development of local economy;

•To construct such a large-scale wind power plant, the project owner spends a lot to purchase wind turbines and other auxiliary equipment such as transformers and distributed control system etc. The huge investment provides an opportunity for the expansion of related industrial branches and factories, hence stimulates the growth of wind power industry and development of wind power technology in China.

1.2 Sectoral Scope and Project Type

The Project falls in the sectoral scope 1: energy industries (renewable-/non-renewable sources). The Project is not a grouped project.

1.3 Project Proponent

Organization name	Ningxia Zhongwei Aluminum New Energy Co., Ltd
Contact person	Sun Ping
Title	Project Owner
Address	No 218, Xinchang West Road, Yinchuan City
Telephone	+86-951-6733432
Email	teng_hp@126.com

1.4 Other Entities Involved in the Project

Organization name	Beijing Cronus Technology Consultancy Centre
Role in the project	Consulting company
Contact person	Yao Baojie
Title	General Manager
Address	No 48, Xueyuan Road, Beijing, China
Telephone	+86-10-67618208,
Email	yaobaojie@126.com

1.5 Project Start Date

15/04/2017

(The project started to operation on 15/04/2017.)

1.6 Project Crediting Period

The VCS crediting period of the Project is from 15/04/2017 to 14/04/2027, totally 10 years.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	
Large project	✓

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
Year 2017	520,557
Year 2018	727,982
Year 2019	727,982
Year 2020	727,982
Year 2021	727,982
Year 2022	727,982
Year 2023	727,982
Year 2024	727,982
Year 2025	727,982
Year 2026	727,982
Year 2027	207,425
Total estimated ERs	7,279,820
Total number of crediting years	10
Average annual ERs	727,982

1.8 Description of the Project Activity

a) Technology to be employed before the proposed project:

The proposed project is to utilize wind resources for electricity generation in Zhongwei city, Ningxia Autonomous Region, P. R. China. The scenario existing prior to the start of the implementation of the project is to provide the same annual electricity output as the project by NWPG, including CO₂, which is dominated by the fossil-fuel fired power plants. The baseline scenario is the same as the scenario existing prior to the start of implementation of the proposed project activity.

b) Technology to be employed by the proposed project:

The project involves the installation of 265 sets of 1,500 kW wind turbines. The total installed capacity of the project is 397.5MW. Estimated annual power generation is 948,633.8MWh. The Project will achieve average greenhouse gas (GHG) emission reductions of 727,982 tCO₂e annually by displacing power generation by fossil fuel-fired power plants connected into the NWPG. The estimated annual operation hours are 2,386.5h and the estimated plant load factor is 27.2%.

Technical parameters of the wind turbines employed by the Project are illustrated in Table A.1.

Table. Technical parameters of the wind turbines

Wind turbine	
Rated capacity	1,500kW
Impeller diameter	82~89m
Wheel hub height	70m
Cut-in wind speed	3.0m/s
Rated wind speed	10.5m/s
Cut-out wind speed	25m/s
Max design wind speed	52.5m/s
Rated voltage	690kV
Manufacturer	Dongfang Electric Corporation Dongfang Turbine Co., Ltd
Designed lifetime	20 years

Each turbine will be equipped with one transformer. The power to be generated by the turbines will be delivered to the 110kV on-site substation by 35kV transmission lines. A monitoring point will be set within plant where electricity meter is installed to measure the net power supply of the proposed project.

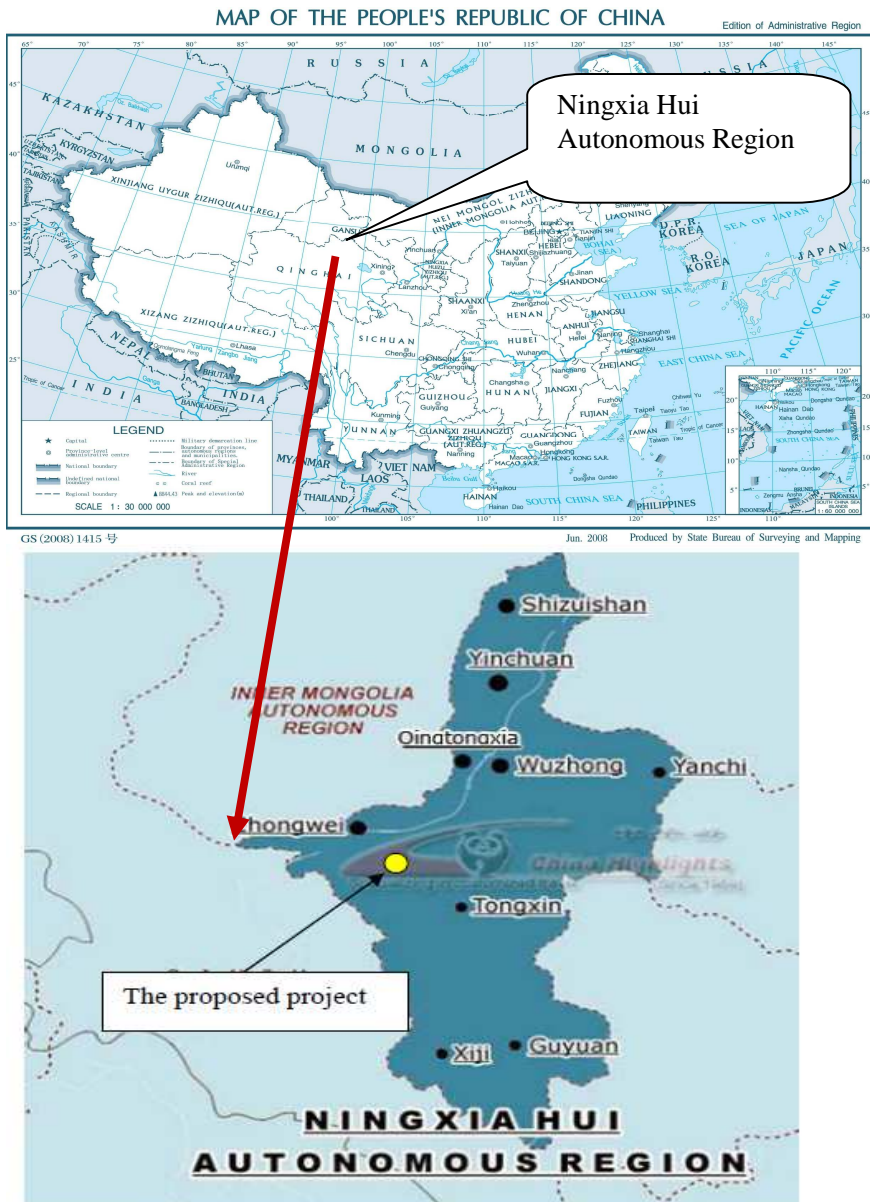
Strict environmental protection measures will be adopted according to EIA report, and the technology applied is environmentally safe, sound and will not bring negative impact to the local ecosystem.

The technologies employed in the proposed project activity are domestic technologies, which is no technology transfer activity involved.

1.9 Project Location

The proposed project is located southwest of Zhongwei City, Ningxia Hui Autonomous Region, People’s Republic of China. The coordinates of the proposed project location are 106°41’32” to 108°23’65” east longitude and 37°14’05” to 39°05’23” north latitude. The site is 1,700-1,350m above sea level.

Fig. 1 shows the location of the project.



1.10 Conditions Prior to Project Initiation

The scenario existing prior to the start of the implementation of the project activity is same as the baseline scenario as described below.

Electricity delivered by the project activity to the NWPG would have otherwise been generated in grid-connected fossil fuel-based power plants resulting in Green House Gas (GHG) emissions in the absence of the project activity. The project activity therefore, by displacing relatively carbon intensive grid electricity (primary emission source with a Combined Margin Emission Factor of 0.7674tCO₂e/MWh) with renewable

wind power electricity, reduces GHG emission that would have occurred in the baseline.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project is a state-supported project in the field of renewable energy and meets the relevant provisions of the Renewable Energy Law of the People's Republic of China. The generation of power from NWPB will meet the requirement of national laws and regulations, also financially viable.

1.12 Ownership and Other Programs

1.12.1 Project Ownership

The approval of Environmental Impact Assessment (EIA), Feasibility Study Report (FSR), and the business license of the project owner are evidences for legislative right. Besides, the purchasing contract of turbine generator, and the purchasing power agreement are the evidences for the ownership of the plant, equipment and process generating.

1.12.2 Emissions Trading Programs and Other Binding Limits

The Project didn't do CDM process. The project proponent chose a clear VCS crediting period from 15/04/2017 to 14/04/2027 which has not created another form of environmental credit.

1.12.3 Other Forms of Environmental Credit

The Project has not been registered as a CDM project in UNFCCC or any other platform.

1.12.4 Participation under Other GHG Programs

The Project has not been registered as a CDM project in UNFCCC or any other platform.

1.12.5 Projects Rejected by Other GHG Programs

NA.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

The project is not a grouped project.

Leakage Management

NA

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Sustainable Development

The proposed project will contribute to sustainable development mainly by:

- Reducing the emission of CO₂ and other pollutants compared with fuel-fired power plant;
- Creating local employment opportunities during the construction (more than 200 people) and operation (65 people) of the proposed project and improving the living standard of local people;
- With the help of the road, which was constructed due to the proposed project, agriculture and other products could be transported from the mountains of Xiangshan to city by Local farmers. It can reduce poverty, which is very important to Ningxia, a poverty-stricken region energy resources of Northwest Power Grid;
- The implementation of the proposed project will help to change the energy structure, and thereby, contribute to the development of local economy;
- To construct such a large-scale wind power plant, the project owner spends a lot to purchase wind turbines and other auxiliary equipment such as transformers and distributed control system etc. The huge investment provides an opportunity for the expansion of related industrial branches and factories, hence stimulates the growth of wind power industry and development of wind power technology in China.

Further Information

NA.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

1. Baseline & Monitoring methodology:

Approved consolidated baseline and monitoring methodology ACM0002 “Consolidated methodology for grid-connected electricity generation from renewable sources” (Version 19.0).

2. Reference:

“Tool for the demonstration and assessment of additionality” (Version 07.0)

“Tool to calculate the emission factor for an electricity system” (Version 07.0)

More information on the methodology and tools listed above is available at the following website:

<http://cdm.unfccc.int/methodologies/index.html>

2.2 Applicability of Methodology

The baseline and monitoring methodology ACM0002 (Version 19.0) is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s). The project belongs to option (a).

The methodology is applicable under the following conditions:

Table. Justification of the choice of the methodology

Requests in methodology	The project situation	Applicability
This methodology is applicable to grid-connected renewable energy power generation project activities that: (a) Install a Greenfield power plant; (b) Involve a capacity addition to (an) existing plant(s); (c) Involve a retrofit of (an) existing operating plants/units; (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s)/unit(s).	The project is to install a greenfield wind farm and hence comply with the above applicability criterion.	<p style="text-align: center;">Applicable</p>
The methodology is applicable under the following conditions: (a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; (b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal	The project is to install a greenfield wind farm and hence comply with the above applicability criterion.	<p style="text-align: center;">Applicable</p>

<p>power capacity addition projects) the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.</p>		
<p>In case of hydro power plants, one of the following conditions shall apply:¹</p> <p>(a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or</p> <p>(b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density, calculated using equation (3), is greater than 4 W/m²; or</p> <p>(c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 W/m²; or</p> <p>(d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m², all of the following conditions shall apply:</p> <p>(i) The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m²;</p> <p>(ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity;</p> <p>(iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m² shall be:</p> <p>a. Lower than or equal to 15 MW; and</p> <p>b. Less than 10 per cent of the total installed capacity of integrated hydro power project.</p>		<p>The criterion is not applicable to this project. The project is a wind power project.</p>
<p>In the case of integrated hydro power projects, project proponent shall:</p>		<p>The criterion is not applicable to this project. The project is a wind power</p>

<p>(a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or</p> <p>1. (b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore, this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.</p>	<p>project.</p>
<p>The methodology is not applicable to:</p> <p>(a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;</p> <p>(b) Biomass fired power plants/units.</p>	<p>The criterion is not applicable to this project. The project is a greenfield wind power project.</p>
<p>In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is “the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance”.</p>	<p>The criterion is not applicable to this project. The project is a greenfield wind power project.</p>

Therefore, the methodology ACM0002 (Version 19.0) is applicable to the Project.

2.3 Project Boundary
Spatial boundary

According to ACM0002 (Version 19.0), the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the VCS project power plant is connected with.

In “Tool to calculate the emission factor for an electricity system”, the project electricity system is defined as the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (i.e. the renewable power plant location) and that can be dispatched without significant transmission constraints. A connected electricity system is defined as an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint.

According to “Tool to calculate the emission factor for an electricity system”, the delineation of project electricity system and connected electricity systems has published by the China’s DNA is used¹ on 20/12/2018. NWPG, including CO₂ is the project electricity system, which is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints. The proposed project activity is connected to the Ningxia power grid, which is part of the NWPG. Therefore, the spatial extent of the Project boundary also includes all the power plants physically connected into the NWPG. The Figure following indicates the project boundary.

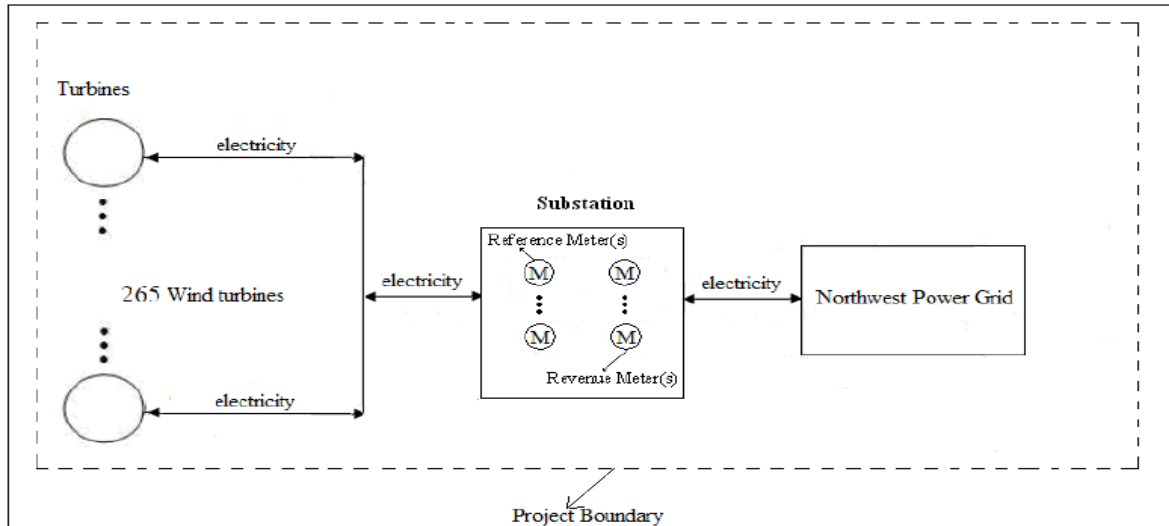


Figure. Project boundary Emission sources and gases

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in the table below.

¹ Sources from China’s DNA : <http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf>

Table. GHG emissions in Project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity generation in fossil fuel fired power that is displaced due to the project activity.	CO ₂	Yes	Main emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
Project Activity	The proposed project activity.	CO ₂	No	The proposed project is a zero-emission wind power project. Not applicable

2.4 Baseline Scenario

According to ACM0002 (Version 19.0), if the project activity is the installation of a new grid-connected renewable power plant (the proposed project is a newly built wind power project), the baseline scenario is the following:

“Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the Tool to calculate the emission factor for an electricity system.”

The project activity is the installation of a new grid-connected renewable power plant/unit, and is not a modification/retrofit of an existing plant/unit, therefore, the baseline scenario is provision of the equivalent amount of electricity generated by NWPG connected power plants and the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”.

In accordance with the ACM0002 methodology, baseline emissions are equal to power delivered to the grid, multiplied by the baseline emission factor. The baseline emission factor is equal to the combined margin: a weighted average of the operating margin emission factor and the build margin emission factor. See Section 2.5 for details.

2.5 Additionality

Demonstration and assessment of additionality

According to the “Tool for the demonstration and assessment of additionality” (Version 07.0) approved by EB, the additionality of the project is demonstrated and assessed through the following steps.

Step 0: Demonstration whether the proposed project activity is the first-of-its-kind

The proposed project is not first-of-its-kind, therefore proceed to Step 1.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

The methodology ACM0002, prescribe the baseline for the project activity which is an installation of new grid connected power plant and hence no further analysis is required for identification of alternatives.

Step 2: Investment analysis

The purpose of this step is to determine whether the project activity is not:

- a) The most economically or financially attractive; or
- b) Economically or financially feasible, without an additional revenue/funding, possibly from the sale of volunteer emission reductions (VERs). The investment analysis was conducted in the following steps:

Sub-step 2a. Determine appropriate analysis method

The “Tool for the Demonstration and Assessment of Additionality (Version 07.0)” proposal three analysis methods which are:

- (Option I) Simple cost analysis;
- (Option II) Investment comparison analysis;
- (Option III) Benchmark analysis;

Since the project will earn revenues not only from the VERs sales but also from electricity sales, the simple cost analysis method is not appropriate. Investment comparison analysis method is only applicable to projects whose alternatives are similar investment projects. The Alternative d) is purchasing electricity from NWPG rather than investment a new project. Therefore, Option II is not appropriate. The project will use benchmark analysis method (Option III) based on the consideration that benchmark IRR of the power sector is available.

Sub-step 2b. Option III. Apply benchmark Analysis

According to “Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects”², the financial benchmark for China electrical industry is 8%. When the Project IRR(after tax) is above the corresponding benchmark, the project is financially feasible and economically reasonable. On the basis of the benchmark, calculation and comparison of financial indicators are carried out in sub-step 2c.

Sub-step 2c. Calculation and comparison of financial indicators

- 1) Basic parameters for calculation of financial indicators

Based on the Feasibility Study Report (FSR), the main input values for the investment analysis are shown in the Table 2.4.

² Beijing: China Electric Power Press, 2003

Table. Financial parameters of the project

Parameters	Unit	Value	Source
Total Investment *	10 ⁴ RMB	397,089.1	FSR
Static Assets *	10 ⁴ RMB	389,500.0	FSR
Bank loan	10 ⁴ RMB	309,760.0	FSR
Loan Interest	%	4.90	FSR
Fluid Capital	10 ⁴ RMB	1188.5	FSR
Electricity Tariff (including VAT)	RMB/kWh	0.54	FSR
Annual Power Supply	MWh/yr	948,633.8	FSR
Income Tax	%	25	FSR
Value-added Tax	%	17***	FSR
City Maintenance and Construction Tax	%	7	FSR
Educational Surcharge Tax	%	3	FSR
Depreciation year	year	15	FSR
Depreciation Rate	%	6.33	FSR
Residue Rate	%	5	FSR
Annual O&M cost**	10 ⁴ RMB/ yr	11,095.0	FSR
Employee	Person	65	FSR
Welfare rate	%	41	FSR
Insurance Rate	%	0.25	FSR
Rate of repair fee (2-3)	%	1.2	FSR
Rate of repair fee (4-6)	%	1.5	FSR
Rate of repair fee (7-21)	%	1.8	FSR
Material fee	10 ⁴ RMB/ yr	596.3	FSR
Other fee**	10 ⁴ RMB/ yr	1987.5	FSR
Operation year	year	20	FSR

* Excluding deductible equipment input tax

** Excluding input tax

*** In investment analysis, the impact of VAT refund preferential policy was taken into account.

2) Comparison of IRR for the proposed project and the financial benchmark

The financial analysis shows that without the revenue of VERs, the Project IRR (after tax) is 6.78%, much lower than the benchmark. It indicates that there is significant investment barrier. However, the revenue from the sale of VERs is expected to have a significant impact on the IRR. Although some uncertainties still exist, investors would gain reasonable financial return to reduce the risk.

Table. Project IRR (after tax)

Parameters	Value
IRR without VCS revenue	6.78%
Benchmark	8.00%

Sub-step 2d. Sensitivity analysis

The sensitivity analysis shows the robustness of the conclusion regarding financial attractiveness in reasonable variations in the critical assumptions. For the proposed project, the most important parameters impacting the project IRR (after tax) are:

- Static Investment
- O&M Cost
- Electricity Tariff
- Electricity output

In line with Tool 27 “Methodological tool: Investment analysis” (version 09.0, EB101)³, the range of variations in the sensitivity analysis is between -10% and +10%, which is also in line with normal practice in China. Greater variations are unlikely. In case of the ±10% variation range of the four parameters, the fluctuations of the IRR (without VER revenue) are showing below:

Table. Sensitive analysis of the project

Variation range IRR	-10%	-5%	0%	+5%	+10%
Static Investment	8.34%	7.53%	6.78%	6.08%	5.42%
O&M Cost	7.12%	6.95%	6.78%	6.61%	6.43%
Electricity Tariff	5.19%	6.00%	6.78%	7.53%	8.26%
Electricity output	5.19%	6.00%	6.78%	7.53%	8.26%

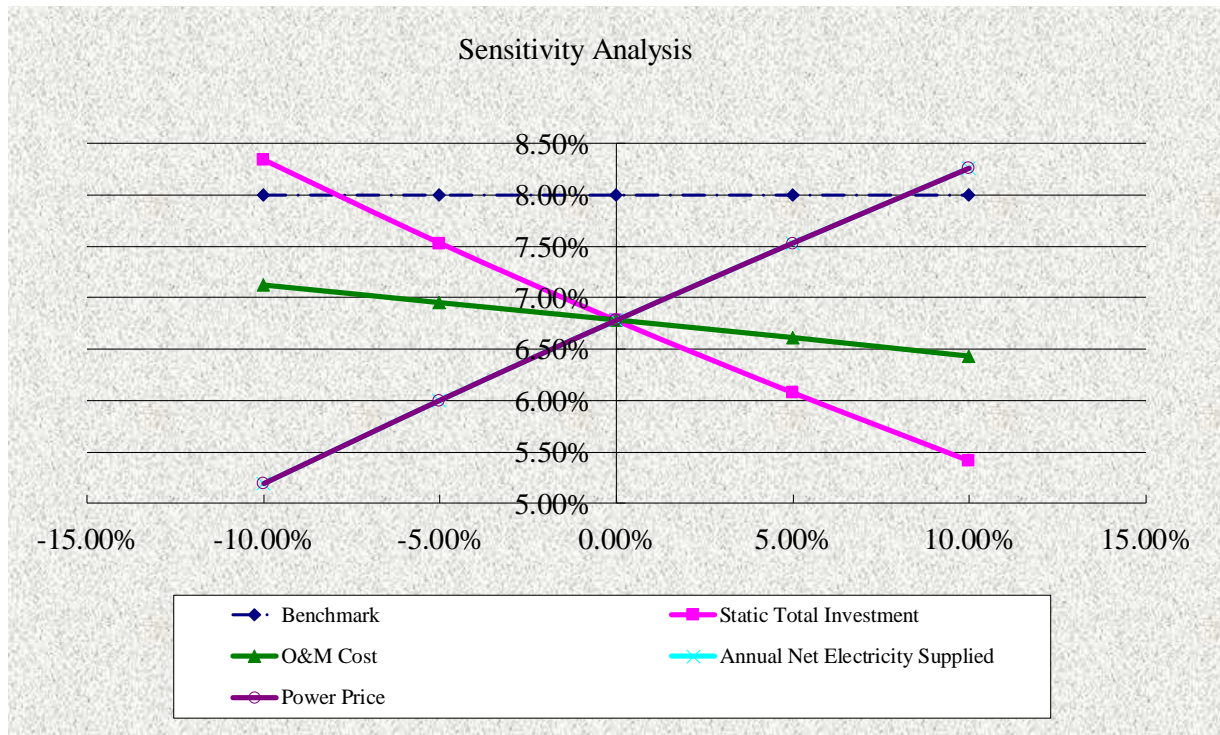


Figure 2.2. Sensitive analysis of the project

³ Data source: <http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-27-v9.0.pdf>

We can conclude from the above analysis that, the project IRR (after tax) will not surpass the benchmark within $\pm 10\%$ variation range. However, the revenue from the VERs will greatly improve the financial performance of the proposed project.

From the sensitivity analysis, we can find out that the project IRR (after tax) is affected by Static Investment, O&M Cost, electricity tariff, and electricity output. To demonstrate above conclusion is credible, an extreme analysis is concluded to show when the project IRR (after tax) will reach the benchmark 8% at following conditions:

Table. Conditions make the IRR (after tax) reach the benchmark

Parameters	Overall
Static Investment	-7.95%
O&M Cost	-36.50%
Electricity Tariff	8.20%
Annual power supply	8.20%

However, none of these conditions can be achieved due to the following reasons:

1) Static Investment

According to the FSR, add back deductible equipment input tax, the static investment is 3,895.00 million RMB, the investment per kilowatt of the project is only 9798.74 RMB/kW. The investment is compared with the values presented by one of the most famous wind energy studies in the world, "Wind Energy- The facts" implemented by a consortium led by the European Wind Energy Association (EWEA) and published in March 2009⁴. According to the study, the investment costs per kW typically vary from around €1000/kW to €1350/kW⁵ (9094 RMB/kW to 12277 RMB/kW⁶).

According to the registered wind projects in Ningxia Autonomous Region with the same installed capacity as the proposed project⁷, the range of static investment per kilowatt is from 8141.90 RMB/kW (Reference No. 8187⁸) to 9,848.81 RMB/kW (Reference No. 6893⁹). The static investment of the proposed project is within the range and is therefore reasonable and credible compared with other projects.

If the static investment (excluding deductible equipment input tax) decreases by 7.95%, the project IRR reaches the benchmark. According to the Final Accounting Report, the static investment is 3950.45million RMB, more than the estimated static investment in the FSR. Hence, the project IRR (after Tax) unlikely reaches the benchmark due to investment decreasing.

2) O&M cost

Only if O&M cost decrease by 36.5% would the project IRR reach to the benchmark. It is not realistic to expect a decrease of O&M cost by 36.5%. The O&M cost mainly contains employee

⁴ Data source: <http://www.wind-energy-the-facts.org/en/home--about-the-project.html>

⁵ Data source: Wind Energy – The Facts, Part III, The Economics of Wind Power, page 200, March 2009 (<http://www.wind-energy-the-facts.org/documents/download/Chapter3.pdf>)

⁶ Using the exchange rate at the time of the publication (31 March 2009), www.x-rates.com

⁷ Data source: <http://cdm.unfccc.int/Projects/projsearch.html>

⁸ <http://cdm.unfccc.int/Projects/DB/DNV-CUK1352792646.16/view>

⁹ <http://cdm.unfccc.int/Projects/DB/RINA1343729329.42/view>

salary and welfare, maintenance fees, material expense and insurance fees, which are essential to maintain the normal operation of the proposed project. And the price of equipments, raw materials and wage standard in China has been continued rising over the year 20, so the possibility for O&M cost to decrease is not realistic. Furthermore, the actual O&M cost for the first operating year of this project is 93.34million RMB, which is higher than the estimated 1st year O&M cost (91.67million RMB) and 15.9% lower than the 20 years average O&M cost (110.95 million RMB/yr) in the FSR. Thus, it is unlikely that O&M cost would decrease by as much as 36.5%.

As analysed above, it can be concluded that in the absence of CDM income, the proposed project is not financially attractive.

3) Electricity tariff

According to the notice about completing the on-grid power tariff with the wind power generation from NDRC in Dec 2015 (Fagaijiage [2015] 3044)¹⁰, which is the latest applicable tariff information available at the time of FSR approval. There are four different wind resources regions were defined based on the different wind resource status and the corresponding feed-in tariff in the notice. Actually the tariff of wind farm projects in the III wind resources region is 0.46 RMB/kWh (Excluding VAT) in Ningxia Autonomous Region, where the proposed project is located. Therefore, the tariff 0.46 RMB/kWh (Excluding VAT) of the proposed project that has been used in FSR and PDD is the latest available tariff.

And based on the EB released the "Information note on the highest tariffs applied by the Executive Board in its decisions on registration of projects in the People's Republic of China (version 02)"¹¹ and the data of the registered wind projects in UNFCCC, the highest tariff of wind farm projects in Ningxia Autonomous Region is 0.580 RMB/kWh (Including VAT). With the highest tariff, the project IRR will be 7.88%, which is still below benchmark of 8% when taking the highest historical tariff into account.

The electricity tariff of project is determined as 0.46MB/kWh (Excluding VAT) in Ningxia Autonomous Region which is within the Group III wind resources area¹² For the tariff must increase as much as 8.2% to reach the benchmark 8% when the tariff is come to about 0.50RMB/kWh (Excluding VAT). However, as the tariff is tightly related to the national economy and livelihood of people, the electricity tariff is strictly regulated by China Government rather than the market mechanism. It's impossible to increase so much. Hence, the variation of electricity tariff will not change the result of investment analysis.

4) Annual power supply

The operation hours and plant load factor are in line with both options of the EB Guidelines for the reporting and validation of plant load factors (EB 48 Annex 11): (a) provided to the government while applying the project activity for implementation approval, and (b) determined by a third party contracted by the project participants.

According to the FSR, the annual power supply is estimated based on the records of wind statistic data recent 38 years provided by local meteorological station and one-year wind resources assessment. The FSR institute first calculated the theoretical annual power

¹⁰ Data source: http://jgs.ndrc.gov.cn/zcfg/201512/t20151224_768570.html

¹¹ Data source: http://cdm.unfccc.int/Reference/Notes/reg/reg_note07.pdf

¹² Data source: http://www.ndrc.gov.cn/zcfb/zcfbtz/201612/t20161228_833049.html

generation using the professional software to predict wind climates, wind resources, and power productions of the wind farm. The annual power supply is 948,633.8 MWh with the 2,386.5 operation hours and the corresponding PLF is 27.2% in the FSR. The value of annual power supply will not increase 8.2% to exceed benchmark.

The above analysis shows that the project is not financially feasible without the revenue of VERs, and the sensitivity analysis shows that it is unlikely to be financially attractive compared to the benchmark under any reasonable variations in the assumptions. However, the revenue from the VERs will greatly improve the financial feasibility of the proposed project, and it will also improve the ability to hedge risks.

Step 3 Barrier analyses

This step is not adopted.

Step 4 Common practice analyses

According to “Methodological tool: demonstration and assessment of additionality”, the project is to use wind power for electricity generation. Therefore, the project belongs to the Measures (b) “Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies)”. Common practice should be identified as the follow 4 steps:

Step 4.1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

The designed capacity of the proposed project is 397.5MW, hence the applicable output range for common practice analysis is 198.75MW ~ 596.25MW.

Step 4.2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number Nall. Registered VCS project activities and projects undergoing validation shall not be included in this step;

The project uses domestic technologies, so the default applicable geographical area should be the entire host country. However, in China there are significant differences in terms of wind resources, policies, regulations and economic conditions among different provinces. Therefore, wind power projects in different provinces face very different investment climate, and it is a common practice to set the applicable geographical area at provincial level for wind power projects in China. However, with a population of 96 million people and area of 157,800 km², Ningxia Autonomous Region is smaller than many countries¹³. So, the applicable geographical area is confined within Ningxia Autonomous Region.

Based on the statistics of China Wind Farm Installed Capacity 2013¹⁴ 2014¹⁵ 2015¹⁶ 2016¹⁷ and

¹³ Data source: <http://baike.baidu.com/view/4233.htm>

¹⁴ Data source: <http://www.cwea.org.cn/upload/20080324.pdf>

¹⁵ Data source: http://www.cwea.org.cn/download/display_info.asp?cid=2&sid=&id=31

¹⁶ Data source: <http://www.cwea.org.cn/upload/201006102.pdf>

¹⁷ Data source: http://www.cwea.org.cn/download/display_info.asp?cid=2&sid=&id=39

2017¹⁸, which were written by China Wind Energy Association have indicated that there is 0 projects that deliver the same output or capacity as the proposed project activity and have started commercial operation before the start date of the project (VCS or applying for VCS projects are not included). At the same time, the projects are applying VCS that deliver the same output or capacity as the proposed project activity and have started commercial operation before the start date of the project.

If assumes the number of the projects generating electricity with utilization of other energy sources as N_x (e.g. power generation with utilization of solar, biomass, hydro, etc.), and the number of the project with the same technology as the project as N_{same} . Thus, $N_{all} = N_x + N_{same}$. According to the "Methodological tool: demonstration and assessment of additionality", N_{all} include neither registered VCS project activities, nor projects activities undergoing validation, nor the similar projects started commercial operation after the start date of the proposed project. Therefore, $N_{same} = 0$, then $N_{all} = N_x + 0$.

Step 4.3: *Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff} .*

Based on the analysis above, obviously, the projects generating electricity with utilization of other energy sources are project using different technologies from the proposed project, so $N_{diff} = N_x$ and $N_{same} = N_{all} - N_{diff}$.

Step 4.4: *Calculate factor $F = 1 - N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.*

Based on the above analysis, $F = 1 - N_{diff}/N_{all} = 1 - N_{diff}/N_{all} = 1 - (N_x)/(N_x + 0) = 0 < 0.2$

Step 4.5: *The proposed project activity is a common practice within a sector in the applicable geographical area if the factor F is greater than 0.2 and $N_{all} - N_{diff}$ is greater than 3.*

Since F is less than 0.2, and $N_{all} - N_{diff} = N_{same} = 0$ which is not greater than 3. Therefore, it can be concluded that the project is not a common practice and the project is additional.

Conclusion:

Through analysis in Sub-steps 4a and 4b, the proposed project activity is additional..

¹⁸ Data source: http://www.cwea.org.cn/download/display_info.asp?cid=9&sid=&id=44

2.6 Methodology Deviations

There is no methodology deviations.

3 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

Baseline emissions include only CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \quad \text{(Equation 3.1)}$$

Where:

- BE_y** = Baseline Emissions in year y (tCO₂/yr);
- EG_{PJ,y}** = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the VCS project activity in year y (MWh/yr);
- EF_{grid,CM,y}** = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the .Tool to calculate the emission factor for an electricity system. (tCO₂/MWh)

Calculation of EG_{PJ,y}

The calculation of EG_{PJ,y} is different for (a) greenfield plants, (b) retrofits and replacements, and (c) capacity additions. The project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

$$EG_{PJ,y} = EG_{facility,y} \quad \text{(Equation 3.2)}$$

Where:

- EG_{PJ,y}** = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the VCS project activity in year y (MWh/yr)
- EG_{facility,y}** = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

Calculation of EF_{grid,CM,y}

The emission coefficient (measured in tCO₂/MWh) should be calculated in a transparent and conservative manner as: a combined margin (CM), consisting of the combination of operating margin(OM) and build margin (BM) according to the procedures prescribed in the “Tool to calculate the emission factor for an electricity system”.

The data used for calculation are from an official source (where available) and publicly available. The calculation processes are as follows:

STEP 1: Identify the relevant electricity system.

STEP 2: Choose whether to include off-grid power plants in the project electricity system.

STEP 3: Select a method to determine the operating margin (OM).

STEP 4: Calculate the operating margin emission factor according to the selected method.

STEP 5: Calculate the build margin (BM) emission factor.

STEP 6: Calculate the combined margin (CM) emissions factor.

STEP 1. Identify the relevant electricity system

According to *Tool to Calculate the Emission Factor for an Electricity System*, If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used.

According to the *2017 Baseline Emission Factors for Regional Power Grids in China* published by DNA, the NWPB is defined as the **project electricity system**, which including CO₂.

STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional)

According to “Tool to calculate the emission factor for an electricity system”, there are two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

In China, off-grid plants are not significant as electricity grids under government control are dominant power supplier. Following the calculations of the China’s DNA, **Option I** is chosen for operating margin and builds margin emission factor calculation.

STEP 3. Select a method to determine the operating margin (OM)

According to “Tool to calculate the emission factor for an electricity system”, there are four methods for calculating the *EF_{grid,OM,y}*.

- a) Simple OM, or
- b) Simple adjusted OM, or
- c) Dispatch Data Analysis OM, or
- d) Average OM

Of these, the dispatch data analysis OM cannot be used for the reason that the detailed dispatch data are not available to the public or to the project participant. For the same reason, the simple adjusted OM cannot be used. The average OM does not take into account the non-dispatch nature of low-cost/must-run resources constitutes less than 50% of total grid generation, thus option a, simple OM has been chosen for calculation.

Option a can be used if low-cost/must run resources¹⁹ constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages data for hydroelectricity production. It can be found from China Electric Power Yearbook²⁰. that the

¹⁹ Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants.

²⁰ China Electric Power Yearbook 2006-2010

low-cost/must run resources including hydro, geothermal, wind, low-cost biomass constitute less than 50% of NWPG during year 2014 to 2016: 0.67%, 0.79%, 0.86%, 1.27% and 1.30% from 2014 to 2016 respectively. Thus, method (a) is applicable to calculate *EF_{grid, OM, y}*.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

- Ex ante option: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the VCS-PDD to the DOE for validation.
- Ex post option: If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required calculating the emission factor for year *y* is usually only available later than six months after the end of year *y*, alternatively the emission factor of the previous year (*y-1*) may be used. If the data is usually only available 18 months after the end of year *y*, the emission factor of the year preceding the previous year (*y-2*) may be used. The same data vintage (*y*, *y-1* or *y-2*) should be used throughout all crediting periods.

In conclusion, the Ex ante option of the data vintages is chosen to calculate the emission factor of the NWPG by using the simple OM method (option a) for the proposed project.

STEP 4. Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

According to “Tool to calculate the emission factor for an electricity system”, the simple OM may be calculated by one of the following two options:

- Option A: Based on the net electricity generation and a CO₂ emission factor of each power unit²¹; or
- Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

For the project electricity system, the data on fuel consumption, net electricity generation and the average efficiency of each power unit are unavailable, thus option A cannot be used. Nevertheless, the data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system are available, and, nuclear and renewable power generation are considered as low-cost / must-run power sources and the quantity of electricity supplied to the grid by these sources is known, and,

²¹ Power units should be considered if some of the power units at the site of the power plant are low-cost/must-run units and some are not. Power plants can be considered if *all* power units at the site of the power plant belong to the group of low-cost/must-run units or if *all* power units at the site of the power plant do *not* belong to the group of low-cost/must-run units.

off-grid power plants are not included in the calculation which means Option I has been chosen in Step 2, therefore, Option B can be used.

On Option B, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMSimple,y} = \frac{\sum_i (FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y})}{EG_y} \quad (\text{Equation 3.3})$$

Where:

$EF_{grid,OMSimple,y}$	=	Simple operating margin CO ₂ emission factor in year y (t CO ₂ /MWh)
$FC_{i,y}$	=	Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO_2,i,y}$	=	CO ₂ emission factor of fossil fuel type i in year y (t CO ₂ /GJ)
EG_y	=	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year y (MWh)
i	=	All fossil fuel types combusted in power sources in project electricity system in year y
y	=	The relevant year as per the data vintage chosen in Step 3

For this approach (simple OM) to calculate the operating margin, the subscript m refers to the power plants/units delivering electricity to the grid, not including low-cost/must-run power plants/units, and including electricity imports to the grid. Electricity imports should be treated as one power plant source.

Regarding parameter selection, local values of $NCV_{i,y}$ and $EF_{CO_2,i,y}$ should be used where available. If no such values are available, IPCC world-wide default values are preferable. The Net Calorific Value ($NCV_{i,y}$) of each type of fossil fuel used in the calculation comes from China Energy Statistic Yearbook 2016. Emission factors ($EF_{CO_2,i,y}$) of each type of fossil fuel come from IPCC 2006 default values.

The latest results for the calculation of OM emission factor of NWPG (0.9155 t CO₂/GJ) issued on 20/12/2018 by China's DNA are adopted in the proposed project. The concrete calculation process is shown in *2017 Baseline Emission Factors for Regional Power Grids in China* published by China's DNA.

Step 5. Calculate the build margin (BM) emission factor

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1. For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of

VCS-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2. For the first crediting period, the build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The **Option 1** is chosen to calculate without requirement to monitor and recalculate the emissions factor during the crediting period.

The sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

- (a) Identify the set of five power units, excluding power units registered as VCS project activities, that started to supply electricity to the grid most recently ($SET_{5-units}$) and determine their annual electricity generation ($AEG_{SET-5-units}$, in MWh);
- (b) Determine the annual electricity generation of the project electricity system, excluding power units registered as VCS project activities (AEG_{total} , in MWh). Identify the set of power units, excluding power units registered as VCS project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET-\geq 20\%}$, in MWh);
- (c) From $SET_{5-units}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. In this case ignore steps (d), (e) and (f).

Otherwise:

- (d) Excluded from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as VCS project activities, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample-CDM}$) the annual electricity generation ($AEG_{SET-sample-CDM}$, in MWh);

If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET-sample-CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample-CDM}$ to calculate the build margin. Ignore steps (e) and (f).

Otherwise:

- (e) Include in the sample group $SET_{\text{sample-CDM}}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);
- (f) The sample group of power units m used to calculate the build margin is the resulting set ($SET_{\text{sample-CDM}>10\text{yrs}}$).

The build margin emissions (BM) factor is the generation-weighted average emission factor (tCO₂e/MWh) of all power units m during the most recent year y for which electricity generation data is available, calculated as follow:

$$EF_{\text{grid, BM, } y} = \frac{\sum_{i,m} EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (\text{Equation 3.4})$$

Where:

- $EF_{\text{grid, BM, } y}$** = Build margin CO₂ emission factor in year y (t CO₂/MWh)
- $EG_{m,y}$** = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
- $EF_{EL,m,y}$** = CO₂ emission factor of power unit m in year y (t CO₂/MWh)
- m** = Power units included in the build margin
- y** = Most recent historical year for which electricity generation data is available

In China, EB accepts²² the following deviation in methodology application:

1. The group of power plants to be considered for the determination the BM emission factor can't be selected as no plant specific generation data are available. Instead, the capacity addition from one year to another is used as basis for determining the build margin, i.e. the capacity addition over 1 - 3 years, whichever results in a capacity addition that is closest to 20% of total installed capacity.
2. Use proportional weights that correlate to the distribution of installed capacity in place during the selected period above, using plant efficiencies and emission factors of commercially available best practice technology in terms of efficiency. It is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

Since there is no way to separate the different generation technology capacities as coal, oil or gas etc from thermal power based on the present statistical data, the following calculating measures will be taken:

- Firstly, according to the energy statistical data of most recent one year, determine the ratio of CO₂ emissions produced by solid, liquid, and gas fuels consumption for power generation;

²² This is in accordance with the “Request for guidance: Application of AM0005 and AMS-I.D in China”, a letter from DNV to the Executive Board, dated 07/10/2005, available online at:

<http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM>

This approach has been applied by several registered CDM projects using methodology ACM0002 so far.

- Second, multiply this ratio by the respective emission factors based on commercially available best practice technology in terms of efficiency;
- Finally, this emission factor for thermal power is multiplied with the ratio of thermal power identified within the approximation for the latest 20% installed capacity addition to the grid. The result is the BM emission factor of the grid.

SUB-STEP 5a: Calculate the power generation emissions for solid, liquid and gas fuel and each share of total emissions based on the *Energy Balance Table* of the most recent year.

$$\lambda_{Coal,y} = \frac{\sum_{i \in Coal,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (\text{Equation 3.5})$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in Oil,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (\text{Equation 3.6})$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in Gas,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (\text{Equation 3.7})$$

Where:

$F_{i,j,y}$	The amount of fuel i (in a mass or volume unit) consumed by power plant/unit j in year(s) y ;
$NCV_{i,y}$	The net calorific value (energy content) of fossil fuel type i (coal, oil and gas) in year y (GJ/Mass or Volume unit);
$EF_{CO_2,i,j,y}$	The CO ₂ emission factor of fuel type i (coal, oil and gas) in year(s) y (tCO ₂ e/GJ);
Coal, Oil and Gas	Solid fuel, liquid fuel and gas fuel respectively;

SUB-STEP 5b: Calculate emission factor for thermal power of the grid based on the result of Step a. and the efficiency level of the best technology commercially available in China.

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \quad (\text{Equation 3.8})$$

Where:

$EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas,Adv,y}$ refer to the emission factors of efficiency level of the best technology commercially utilized in power generation using coal, oil and gas in China.

SUB-STEP 5c: Calculate BM of the grid based on the result of Step b and the share of thermal power of recent 20% capacity additions.

$$EF_{grid, BM, y} = \frac{CAP_{Thermal, y}}{CAP_{Total, y}} \times EF_{Thermal, y} \quad (\text{Equation 3.9})$$

Where:

CAP_{Total} is total capacity additions while $CAP_{Thermal}$ is capacity additions of thermal power.

As mentioned above, the build margin emission factor of the baseline is calculated ex-ante and will not be renewed in the first crediting period. $EF_{grid, BM, y}$ adopts the data updated by China DNA on Dec. 20th, 2018. The exact calculation process of $EF_{grid, BM, y}$, can be found at: <http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf>

The published Build Margin Emission Factor is **0.3232 tCO₂/MWh**.

STEP 6: Calculate the combined margin (CM) emissions factor

The calculation of the combined margin (CM) emission factor ($EF_{grid, CM, y}$) is based on one of the following methods:

- (a) Weighted average CM; or
- (b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option. The combined margin emissions factor is calculated as follows:

$$EF_{grid, CM, y} = EF_{grid, OM, y} \times w_{OM} + EF_{grid, BM, y} \times w_{BM} \quad (\text{Equation 3.10})$$

Where:

$EF_{grid, BM, y}$	Build margin CO ₂ emission factor in year y (tCO ₂ /MWh);
$EF_{grid, OM, y}$	Operating margin CO ₂ emission factor in year y (tCO ₂ /MWh)
w_{OM}	Weighting of the operating margin emission factor (%)
w_{BM}	Weighting of build margin emission factor (%)

According to “Tool to calculate the emission factor for an electricity system”, for wind power project, the weights are $w_{OM} = 0.75$ and $w_{BM} = 0.25$ by default, for the first crediting period and for subsequent crediting periods, the combined margin CO₂ emission factor of NWPG corresponds to **0.7674 tCO₂e/MWh**.

3.2 Project Emissions

For wind power projects, the project emissions $PE_y = 0$

3.3 Leakage

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, and transport). These emissions sources are neglected.

3.4 Estimated Net GHG Emission Reductions and Removals

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad (\text{Equation 3.11})$$

Where:

- ER_y = Emission reduction in year y (t CO₂e/yr)
 BE_y = Baseline emission in year y (t CO₂/yr)
 PE_y = Project emission in year y (t CO₂e/yr)

Summary of ex ante estimates of emission reductions is shown as below:

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
15/04/2017-31/12/2017	520,557	0	0	520,557
01/01/2018-31/12/2018	727,982	0	0	727,982
01/01/2019-31/12/2019	727,982	0	0	727,982
01/01/2020-31/12/2020	727,982	0	0	727,982
01/01/2021-31/12/2021	727,982	0	0	727,982
01/01/2022-31/12/2022	727,982	0	0	727,982
01/01/2023-31/12/2023	727,982	0	0	727,982
01/01/2024-31/12/2024	727,982	0	0	727,982
01/01/2025-31/12/2025	727,982	0	0	727,982
01/01/2026-31/12/2026	727,982	0	0	727,982
01/01/2027-14/04/2027	207,425	0	0	207,425
Total	7,279,820	0	0	7,279,820

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid,BM,y}
Data unit	t CO ₂ /GJ
Description	Build margin CO ₂ emission factor in year y
Source of data	Calculations

Value applied:	0.3232
Justification of choice of data or description of measurement methods and procedures applied	Calculated as directed in Section 3.1
Purpose of the data	Calculation of baseline emissions
Comments	

Data / Parameter	$EF_{grid,OM,y}$
Data unit	t CO ₂ /GJ
Description	Operating margin CO ₂ emission factor in year y
Source of data	Calculations
Value applied:	0.9155
Justification of choice of data or description of measurement methods and procedures applied	Calculated as directed in Section 3.1
Purpose of the data	Calculation of baseline emissions
Comments	

Data / Parameter	$EF_{grid,CM,y}$
Data unit	t CO ₂ /GJ
Description	Combined margin CO ₂ emission factor in year y
Source of data	Calculations
Value applied:	0.7674
Justification of choice of data or description of measurement methods and procedures applied	Calculated as directed in Section 3.1
Purpose of the data	Calculation of baseline emissions
Comments	

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{\text{facility},y}$
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project plant to the grid in year y
Source of data	Feasibility Study Report
Description of measurement methods and procedures to be applied	Grid-connected electricity generated by the proposed project will be monitored through the electricity meter(s) with accuracy of 0.2S at the project activity site and recorded monthly. The metering equipments will be calibrated and checked annually for accuracy so that the metering equipments shall have sufficient accuracy.
Frequency of monitoring/recording	The data were measured continuously, recorded hourly and monthly aggregated.
Value monitored	948,633.8
Monitoring equipment	Electricity meter(s) with accuracy of 0.2S
QA/QC procedures to be applied	According to national standard, meter(s) will be calibrated periodically. Data measured by meter(s) will be cross-checked with the sales record.
Purpose of the data	Calculation of baseline emissions
Calculation method	Measured directly by electricity meter. The exact data were the electricity delivered to the power grid minus the electricity supplied by the power grid. The data were measured continuously, recorded hourly and monthly aggregated.
Comments	

4.3 Monitoring Plan

The monitoring plan, implemented by the Project owner, is made to ensure that the emission reductions will be monitored transparently and clearly in the crediting period.

1. Monitoring objective

The objective of this monitoring plan is to ensure the complete, consistent, clear, and accurate monitoring and calculation of the project emission reductions during the entire crediting period. The project owner is responsible for the implementation of the monitoring plan, and the grid company cooperates with the project owner.

2. Monitoring institution

The Project owner will set up a CDM team, the CDM manager of which will be assigned accordingly. The CDM team is charge of collecting, monitoring and verifying the data, while the CDM manager will be assisted by the CDM consultant company. The operational and management structure is as follows:

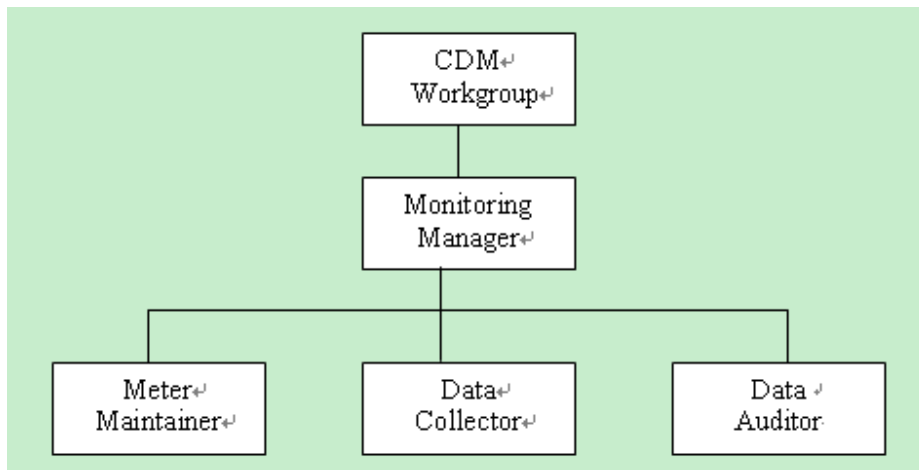


Figure 2.4. Structure of monitoring personnel

3. The monitoring method and equipments installation

Power generated by the project will be feed into the Ningxia Power Grid through transmission line. Bi-directional electricity meters will be installed on the transform substation to directly and continuously measure the feed-in and down-load electricity by the project activity. The accuracy of monitoring meter(s) is 0.2s.

This measuring method is more conservative and will not affect the additionality of the proposed project. Therefore, the net power supplied to grid by the proposed project should be calculated as “ $EG_{facility,y} = EG_{export,y} - EG_{import,y}$ ” during the monitoring period, which should be monitored.

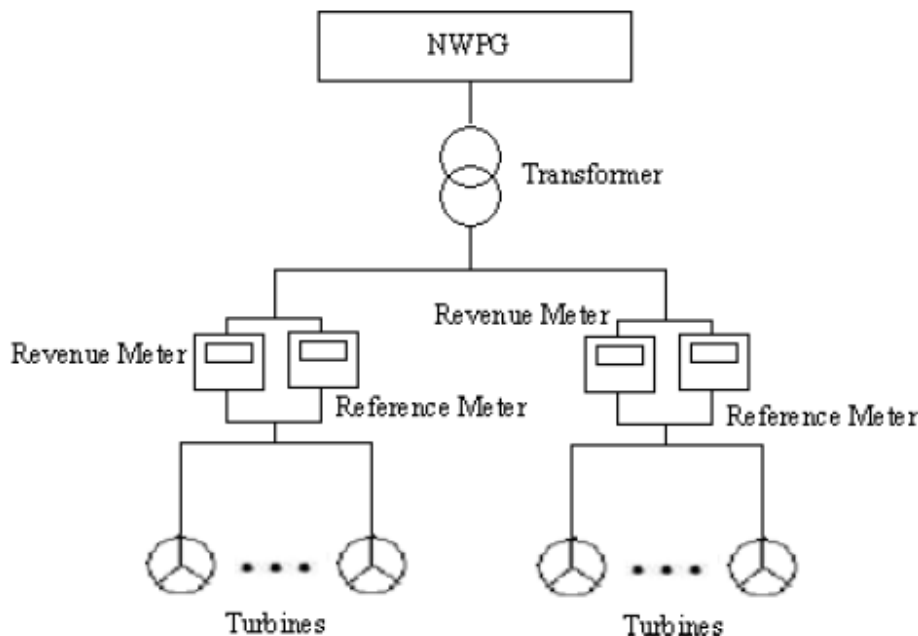


Figure 3 The diagram of wire connection and the meters location

4. Quality Assurance and Quality Control (QA/QC)

QA/QC is to ensure the accuracy of data collected through measures including periodic calibration of monitoring meters, corrective actions, and internal audits.

4.1 Calibration

According to the Technical Administrative Code of Electric Energy Metering (DL/T448-2000), the electric meters will be calibrated periodically. The electric meters will be calibrated by an accredited calibration agency. Calibration certificates of the accredited calibration agency and the relevant calibration documents will be collected by the QA/QC department and transferred to technical department for archiving.

5.2 Corrective actions

If problems which can affect the quality of data occur, the QA/QC department will initiate and supervise the implementation of corrective actions.

5.3. Internal audit

Internal audit is independent. Internal audit procedure will be initiated under any of the following circumstances:

- modification of the monitoring system
- prior to verification

Firstly, the monitoring system will be checked on whether the monitoring system runs properly and whether the monitored results are correct. Secondly, spot check of daily/monthly data report will be undertaken.

5 SAFEGUARDS

5.1 No Net Harm

The Environmental Impact Assessment (EIA) Report for the proposed project was compiled by Ningxia Dingxing Consulting company in Ningxia Hui Autonomous Region. The EIA Report for the proposed project has been approved by the Environmental Protection Bureau of Ningxia Hui Autonomous Region on 05/07/2015, with approval No. "Ninghuanbiao [2015] No.58". According to the approval comments of the EIA Report by the Environmental Protection Bureau of Ningxia Autonomous Region, the environmental impacts likely to be caused by the proposed project are analyzed.

5.2 Environmental Impact

Construction Phase:

Ecological Impact

Because the impeller of the wind turbine of the proposed project is 121m, the flight height of the bird migration is usually lower 1000m, and to the small birds the flight height is less than 300m based on the information. Therefore, the proposed project has little impact on the birds' migration.

Atmosphere Impact

The main air pollution sources during the construction period include off-gases from the operation of many kinds of machines. And the pollutant source is scattered with little emission. Thus the construction will not cause much negative impact on the local air environment.

Wastewater Impact

The waste water from construction is mainly wastewater from the construction activity and the sewage from construction staff. The construction waste water was mainly sediment waste water, with some measures to reduce the impact, including collecting, depositing etc., and then recycled to clean the construction sites. And the sewage from construction staff is mainly used to green and fall dust. So the wastewater will not have the impact on the local water environment.

Noise impact

During the construction period, the noise of the construction is between 84dB and 105dB, mainly including piling machine, loading shovel and other transport vehicles. Because of the proposed project site is located in the hill and there is few residents. Furthermore, the sensitive region is at a distance of 400m away from the wind farm. According to relative standards, some steps are to be taken to reduce the noise impact. So the noise impact has little impact on the project site.

Solid Waste Impact

The solid wastes in the construction period including the construction wastes and household garbage will be collected. The construction wastes will be treated on site and the household garbage will be moved to a designated site to be disposed properly. So the solid wastes will not have the impact on the environment.

Transportation Impact

There is not heavy transportation load to the project site. Therefore, the transportation impact has little impact on the nearby residents.

Operation Phase:

Ecological Impact

Due to the low noise of the wind turbines, the proposed project has no effect to the birds during the operation period. Because there are no residents and other radio communication facilities

within the assessment range, the electromagnetic radiation of the proposed project has little impact on the surrounding environment.

Atmosphere Impact

During the operation period, the emission resources are mainly from the restaurant in the project site. Using the clean fuel and discharge after purification, there is no impact on the local atmosphere impact.

Wastewater Impact

The proposed project has the 1.0 m³/d wastewater, which has been biochemical treatment, used to fall dust with surrounding areas. Hence, the waste water will not have the impact on the local water environment.

Noise impact

There is the noise of the wind turbines operation during the operation time. The nearest resident regions are 400m away from the wind farm, so the noise does not influence the residential districts nearest to the site.

Solid Waste Impact

After the project completed, the solid waste is mainly household garbage with the output 2.4t/a, which should be airtight and stored in the control centre, then moved to the garbage collected site. And the waste oil of wind turbine is about 99kg/a, which is the hazardous waste and should be recycled and disposed by the manufacturer when they have maintained the wind turbine based on the relative hazardous waste disposal regulation. So the solid wastes will not have the impact on the environment.

Conclusion

After the above measures are performed, the negative impacts on environment will be minimized below the requirements of laws and regulations during the construction and operational period.

5.3 Local Stakeholder Consultation

To let the public realize the objective of the proposed project, support and cooperate with construction of the project, and heighten the environmental benefits and social benefits of the proposed project, the project proponent developed a stakeholders' survey of the proposed project in Nov 2017, to collect comments and requirement of public in the related region.

The first stage

The public participation was organized in Nov 2016 for collecting stakeholder's views and opinions mainly focused on the environmental impacts through releasing questionnaire and public announcement, partly by interview one by one:

Medium bulletin: make medium bulletin in the local residential area near the location site and release bulletin survey of stakeholders in the residential area near the project construction site. The bulletin contents include general description of the proposed project, public participation load table and contact method.

Questionnaire survey: The survey objects include local government and related departments of Xiangshan County, the local villagers living nearby Xiangshan Wind power project. During the survey of stakeholders, 150 questionnaires were released, and 145 questionnaires were got back, the return ratio is 96.7%. In addition, 40 people is interviewed and consulted.

The second stage

To know the public’s suggestions and advices mainly on the issues of VCS application of the proposed project, the project owner did the stakeholders’ survey in Nov 2017. The survey range was in Xiangshan County, 46 questionnaires were released, and all were got back.

The survey shows the stakeholders believe that the proposed VER project activity will have positive impacts on the local ecology and employment. Some stakeholders expressed concerns about potential increased soil erosion in the area due to the project activity. All stakeholders expressed their support to the proposed project. A full list of the filled-in questionnaires is available from the project developer.

5.4 Public Comments

Up to now, there is no any feedback.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	EG _{facility,y}
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Meter Recordings
	Net quantity of electricity supplied to the grid by the project plant during Continuously
Frequency of monitoring/recording	The data were measured continuously, recorded hourly and monthly aggregated.
Value applied	2,001,008.63
Monitoring equipment	M522: Type : DSSD8848 Accuracy class: 0.2s Serial number : No.080002009870 Verification Date : 28/01/2017 (valid till 27/01/2022) Verification Company: Measurement Center of Ningxia Electric Power Company of State Grid

	<p>Calibration Date : 05/04/2017 03/04/2018</p> <p>Calibration Company: Measurement Center of Ningxia Electric Power Company of State Grid (The project owner read M522 on site and record the data at 0:00 everyday)</p> <p>M523: Type : DSSD8848 Accuracy class: 0.2s Serial number : No.080002009875 Verification Date : 28/01/2017 (valid till 27/01/2022) Verification Company: Measurement Center of Ningxia Electric Power Company of State Grid Calibration Date : 05/04/2017 03/04/2018</p> <p>Calibration Company: Measurement Center of Ningxia Electric Power Company of State Grid (The project owner read M523 on site and record the data at 0:00 everyday)</p> <p>M533: Type : DSSD8848 Accuracy class: 0.2s Serial number : No.080002009822 Verification Date : 28/01/2017 (valid till 27/01/2022) Verification Company: Measurement Center of Ningxia Electric Power Company of State Grid Calibration Date : 05/04/2017 03/04/2018</p> <p>Calibration Company: Measurement Center of Ningxia Electric Power Company of State Grid (The project owner read M533 on site and record the data at 0:00 everyday)</p> <p>M534: Type : DSSD8848 Accuracy class: 0.2s Serial number : No.080002009872 Verification Date : 28/01/2017 (valid till 27/01/2022) Verification Company: Measurement Center of Ningxia Electric Power Company of State Grid Calibration Date : 05/04/2017 03/04/2018</p> <p>Calibration Company: Measurement Center of Ningxia Electric Power Company of State Grid (The project owner read M534 on site and record the data at 0:00 everyday)</p>
QA/QC procedures to be	The meters were calibrated yearly. Data measured by the meter

applied	were cross checked by the electricity sales documents, the conservative data between the measured data and data from Electricity Transaction Notes (ETN) were used to calculate CERs during the verification.
Purpose of data	Calculation of baseline emissions or baseline net GHG removals
Calculation method	Measured directly by electricity meter. The exact data were the electricity delivered to the power grid minus the electricity supplied by the power grid. The data were measured continuously, recorded hourly and monthly aggregated.
Comments	/

6.2 Baseline Emissions

Baseline emissions include only CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \quad (\text{Equation 6.1})$$

Where:

- BE_y** = Baseline Emissions in year y (tCO₂/yr);
- $EG_{PJ,y}$** = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the VCS project activity in year y (MWh/yr);
- $EF_{grid,CM,y}$** = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the Tool to calculate the emission factor for an electricity system. (tCO₂/MWh)

Calculation of $EG_{PJ,y}$

The calculation of $EG_{PJ,y}$ is different for (a) greenfield plants, (b) retrofits and replacements, and (c) capacity additions. The project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

$$EG_{PJ,y} = EG_{facility,y} \quad (\text{Equation 6.2})$$

Where:

- $EG_{PJ,y}$** = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the VCS project activity in year y (MWh/yr)
- $EG_{facility,y}$** = Quantity of net electricity generation supplied by the project plant/unit to the

grid in year y (MWh/yr)

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad \text{(Equation 6.3)}$$

Where:

- $EF_{grid,BM,y}$ Build margin CO₂ emission factor in year y (tCO₂/MWh);
- $EF_{grid,OM,y}$ Operating margin CO₂ emission factor in year y (tCO₂/MWh)
- w_{OM} Weighting of the operating margin emission factor (%)
- w_{BM} Weighting of build margin emission factor (%)

According to “Tool to calculate the emission factor for an electricity system”, for wind power project, the weighs are $w_{OM} = 0.75$ and $w_{BM} = 0.25$ by default, for the first crediting period and for subsequent crediting periods, the combined margin CO₂ emission factor of NWPG corresponds to **0.7674** tCO₂e/MWh.

Data/Parameter	$EF_{grid,CM,y}$
Unit	tCO ₂ /MWh
Description	Baseline emission factor
Value(s) applied	0.7674
Purpose of data	Baseline emission calculations
Additional comment	Based on the formula in section 3.2.1 and data from section 3.2.2, the emission factors of NWPG are as follows: $EF_{grid,OM,y}$: 0.9155 CO ₂ /MWh; $EF_{grid,BM,y}$: 0.3232 tCO ₂ /MWh; $EF_{grid,CM,y}$: 0.7674 tCO ₂ /MWh.

6.3 Project Emissions

For wind power projects, the project emissions $PE_y = 0$

Therefore:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} = EG_{facility,y} \times EF_{grid,CM,y} = 2,001,008.63 \text{ MWh} \times 0.7674 \text{ tCO}_2\text{e/MWh} = 1,535,574 \text{ tCO}_2\text{e}$$

Baseline emissions during this monitoring period are shown in the Table below:

The emission reductions ER for the project:

Period		Electricity exported to the grid by the project ($EG_{export,y}$)	Electricity imported from the grid ($EG_{import,y}$)	Net electricity supplied to the grid ($EG_{facility,y} = EG_{export,y} - EG_{import,y}$)
From	To	MWh	MWh	MWh
15/04/2017	30/04/2017	33,869.887	300.000	33,569.89
01/05/2017	31/05/2017	57,631.891	228.000	57,403.89
01/06/2017	30/06/2017	72,520.550	374.400	72,146.15
01/07/2017	31/07/2017	85,607.596	256.800	85,350.80
01/08/2017	31/08/2017	90,868.928	259.200	90,609.73
01/09/2017	30/09/2017	92,445.556	417.600	92,027.96
01/10/2017	31/10/2017	79,804.189	511.200	79,292.99
01/11/2017	30/11/2017	92,109.506	314.400	91,795.11
01/12/2017	31/12/2017	88,190.668	352.800	87,837.87
01/01/2018	31/01/2018	85,944.500	340.800	85,603.70
01/02/2018	28/02/2018	92,099.425	288.000	91,811.43
01/03/2018	31/03/2018	87,039.622	242.400	86,797.22
01/04/2018	30/04/2018	92,431.584	278.400	92,153.18
01/05/2018	31/05/2018	102,531.641	444.000	102,087.64
01/06/2018	30/06/2018	100,607.980	374.400	100,233.58
01/07/2018	31/07/2018	108,683.100	314.400	108,368.70
01/08/2018	31/08/2018	63,284.000	398.400	62,885.60
01/09/2018	30/09/2018	96,745.728	364.800	96,380.93
01/10/2018	31/10/2018	85,532.026	307.200	85,224.83
01/11/2018	30/11/2018	97,318.515	441.600	96,876.92
01/12/2018	31/12/2018	92,320.251	405.600	91,914.65
01/01/2019	31/01/2019	106,867.921	364.800	106,503.12
01/02/2019	28/02/2019	104,480.768	348.000	104,132.77
15/03/2017	28/02/2019	2,008,935.832	7,927.200	2,001,008.63

4. Emission reductions	
Quantity of net electricity generation supplied by the project plant/unit to the grid in year y ($EG_{facility,y}$) (MWh)	2,001,008.63
$EF_{grid,CM,y}$ (tCO ₂ /MWh)	0.7674
The baseline emission (BE_y) (tCO ₂ e)	1,535,574

Total project emissions (PE _y) (tCO ₂ e)	0
ER _y (ER _y =BE _y -PE _y) (tCO ₂ e)	1,535,574

6.4 Leakage

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, and transport). These emissions sources are neglected.

6.5 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
15/04/2017-31/12/2017	529,532	0	0	529,532
01/01/2018-31/12/2018	844,399	0	0	844,399
01/01/2019-28/02/2019	161,641	0	0	161,641
Total	1,535,574	0	0	1,535,574

The emission reductions estimated in the PDD were 1,428,041 tCO₂e (727,982 tCO₂e/365d*716d) during this monitoring period. The actual emission reductions in this monitoring period (716days) were **1,535,574** tCO₂e, the actual emission reductions in this monitoring period are 7.00% more than the estimation in the registered PDD. The higher electricity exported has no impact on the additionally of the project activity as the sensitivity analysis of the project activity shows that the IRR will not exceeds benchmark until an 8.2% increase in Grid-connected electricity.